Research Vessel METEOR

M134:
Port Stanley – Punta Arenas
Fourth weekly report: 6 – 12 February 2017

After finishing the comprehensive sampling and surveying of Cumberland Bay East in the third week, we steamed on the RV METEOR eastwards along the northern coastline of South Georgia, before circumnavigating the eastern end of the island and then heading westwards along the southern coast. During the night we had to keep a minimum distance of 10 nautical miles from the coast for safety reasons, in order to avoid ice bergs and growlers, which drift from the calving glaciers through the island's bays into the open water. As RV METEOR has not the right ice classification (only E2), encounters with ice are to be avoided at all costs. While steaming the multibeam and sediment echo sounders are constantly running surveying the sea floor and the water column. The computer screens show not only patterns of various organisms like krill and fish swarms but also gas flares raising up from the sea floor; the later are our main targets and point us to the location for our dives with the remotely operating vehicle (ROV). A 24 h watch system is run in the bathymetry lab (Fig. 1). The most recent discoveries of the expedition are announced here and for our research expedition the bathymetry lab is the place on the vessel where science planning and command happens.

Fig 1: The hydroaccoustic lab on RV METEOR is run in a 24 h watch system and is the central command office of our expedition. The large windows always allow a view to the outside. It is a pity that the equivalent lab on the new RV Sonne does not have windows anymore.

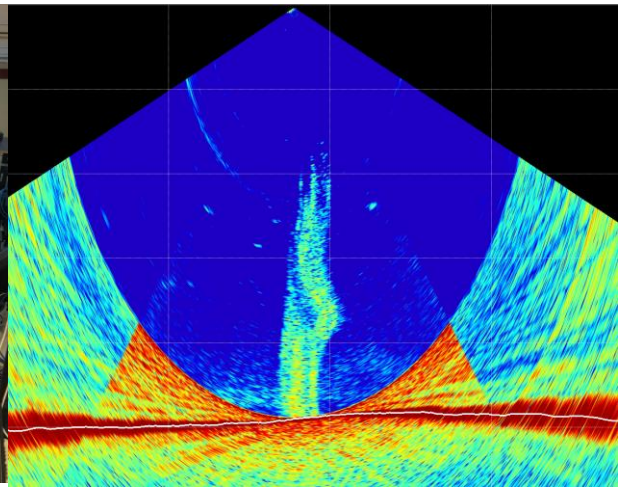

Fig 2: South of Paradise Beach in 18 m water depth the strongest acoustic anomaly was seen in the multibeam EM710, which we called Paradise Flare. Following our current knowledge concentrated gas should be emitted from the seafloor in high intensity here.

During our westward survey we discovered the most intensive flare in the water column on the hard rock ground about 11 km south of Paradise Beach and we called it Paradise Flare (Fig. 2). But when we wanted to study these gas emissions in detail on Monday, 6 February, a dive with ROV SQUID was impossible due to too much swell. We therefore steamed 60 miles to the west, as the weather forecast allowed us 2 days for station work at King Haakon Trough. In general the weather conditions to the south of the island are worse than to the north caused by the influence of the strong West Wind Drift. We experience almost daily changes in the weather. We used these two days for a series of stations with CTD, bottom water sampler, gravity and multi-corers on the southern site of the island.

Two dives to sample the gas emissions at acoustically identified flare positions finished the program off, with dive 29 on Wednesday 8 February being the highlight. As always during this expedition it was difficult at the start of the dive to find and sample the gas emission sites on the bottom of the trough as the bottom water was disturbed and murky, but in the end we were successful. The second part of the dive lead along a nearly 70 m high almost vertical wall, which marked the border of the trough. Everybody on board was fascinated by the extremely rich diversity of the benthic fauna, such as starfish, brittle stars (Fig. 3), sponges, hard and soft corals, bryozoans, hydrozoans, … etc. The vertical wall with its overhanging rocks showed layered sedimentary rocks, which are used by the organisms as hard substrate. The trough runs in north-westerly direction and joins the southern wards leading part of the King Haakon Trough. Already during the bathymetry survey the steep flanks of this trough had been noticed as a clear left-lateral tectonic drift of the seafloor and is a structure in parallel to the Cooper Shear zone that is mapped on the island of South Georgia. During the glacial maximum this trough was used by an ice stream from the direction of Annenkov Island so we gave it the name Annenkov Trough. While most shelf trough runs in radial directions away from the island, Annenkov Trough is completely differently orientated, which can only be explained by tectonic changes to the seafloor. Although the shelf morphology of South Georgia is in general characterised by glacier streams, the multibeam surveys with the echosounder also show details of active plate movements of the shelf base.

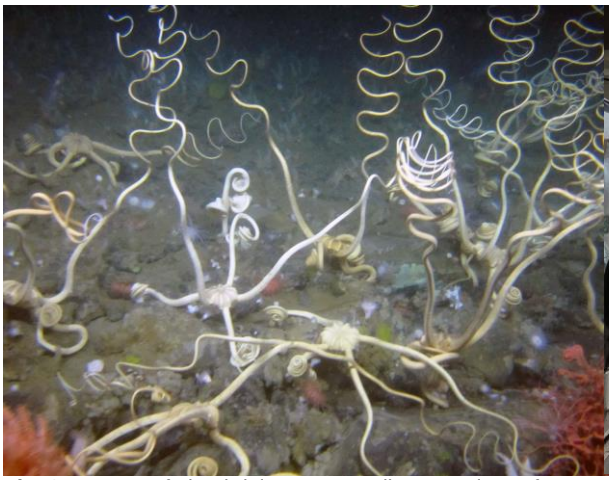

Fig 3: Dance of the brittle stars – Like organisms from another world these brittle stars outstretch their arms into the water column to filter for their food. ROV Dive No. 29 (© MARUM, Uni Bremen).

Fig 4: View from the geo lab onto the working deck of RV METEOR with the snow covered mountain complex of Larsen Harbour in the background, a Jurassic formation of dominantly volcanic rocks.

A series of 3 gravity cores sampled two discordances in the more recent sediment layers, which are very prominently present in the single beam PARASOUND records of King Haakon Trough. Discordances are also present on the northern site of the island in the Royal Trough and are linked with changing current regimes during certain times in the glacial history. Whether the changes in the current systems on the South Georgian shelf carry a global signal or are different in different troughs will be revealed in the comparative analysis of these cores to those taken in the Royal Trough.

The last two days of station work on Wednesday and Thursday were used to collect missing samples in the Royal Trough and Drygalski Fjord. A planned last dive at Paradise Flare had unfortunately to be cancelled because of unsuitable weather conditions and the remaining time until Friday night was used for a further mapping survey of King Haakon Trough.

Best wishes on behalf of everyone on board,

Gerhard Bohrmann RV METEOR Sunday, 12 February 2017